PHYTOTOXICOLOGY ASSESSMENT SURVEY OF THE MAY 1990 FIRE AT THE BRANTFORD ONTARIO HYDRO TRANSFORMER STATION

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1 Background

On May 9, 1990 at approximately 4:00 AM to 6:00 AM, a fire occurred in an electrical transformer located at a transformer station in the City Of Brantford. The station was operated by Ontario Hydro and was located at Glenwood Drive and Brett Street, in a commercial/industrial area of the city. However, the station was bordered on the west by an elementary school and on the south by an agricultural field.

On May 10, 1990, the Phytotoxicology Section received a request from the Ministry of the Environment Cambridge District office for a survey of vegetation and soil in the vicinity of the fire. The Section was informed that according to information provided by Ontario Hydro, the mineral oil in the transformer contained only four parts per million of polychlorinated biphenyls (PCB). A survey to assess possible contamination of soil and vegetation by fire by-products was requested because of the proximity of the school (and the concern of parents for the health of their children) and the agricultural field.

2 Prevailing Winds

Prior to conducting the survey, meteorological records from the nearest reporting stations were obtained to determine the wind direction during the fire. Weather stations at Simcoe, Hamilton, Kitchener and London reported prevailing winds ranging from azimuth 210 to 270 during the period of the fire. Since the fire was located within the area bounded by these four stations, it can be assumed that the wind at the site was generally from a south westerly direction. Such a wind direction would direct emissions away from both the school and agricultural field.

This conflicts with information provided by the District office, which indicated that the smoke and soot was seen drifting over the field. This would have required winds from the northern sectors. However, it should be recognized that the meteorological observations report the dominant wind vector for each observation hour. Wind shifts may have occurred to cause the smoke to be directed over the field at times.

3 Fire Site Description

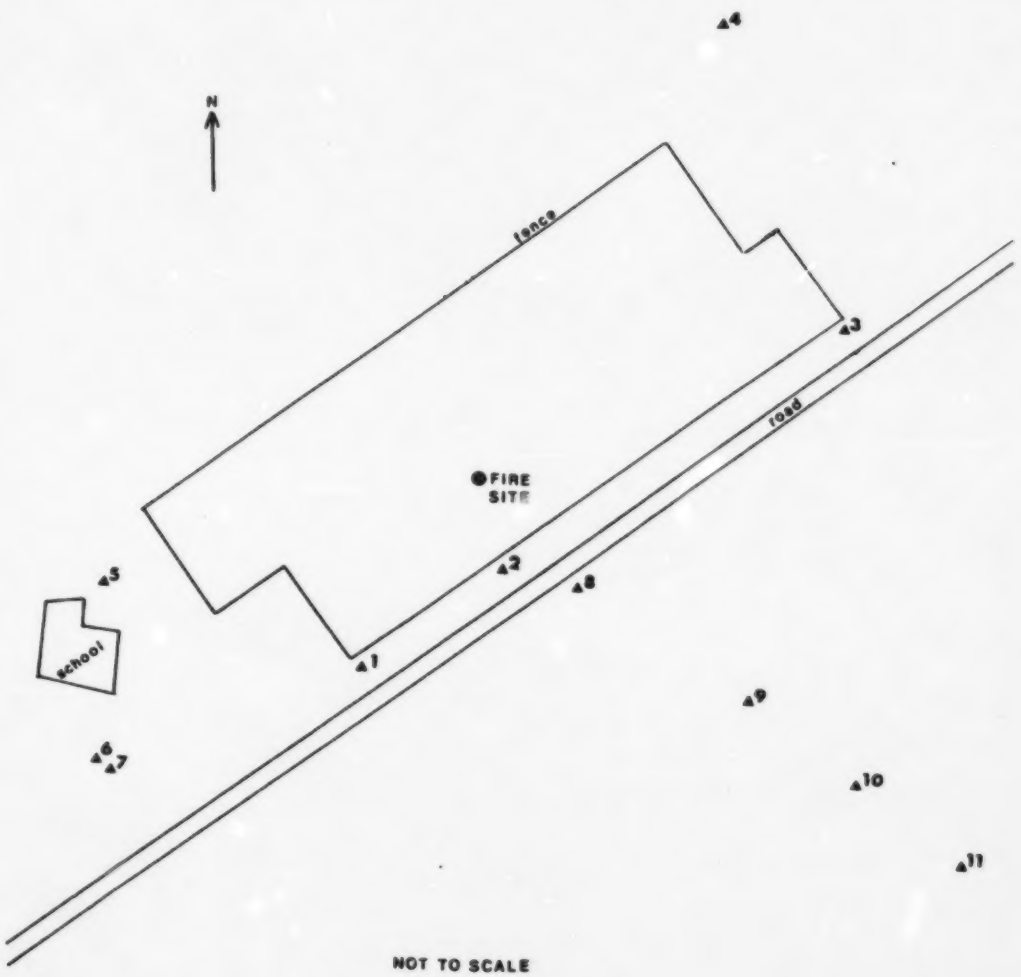
The transformer station consisted of a fenced compound containing several transformers, associated transmission lines and various other structures. Landscaped areas of varying dimensions and apparently part of the station property, surrounded the fenced compound.

St. Jean de Brebeuf School occupied the property immediately west of the station. The school consisted of a brick building, paved parking lot and play area, as well as sodded lawns and a playing field.

The agricultural field to the south was not in production. Remains of corn stalks indicated a corn crop was planted and harvested the previous year (1989).

The following sketch map illustrates the relative locations of the school and field to the station and the transformer. This figure also identifies the locations of foliage and soil samples taken during the investigation.

Sampling Locations at Brantford Transformer Station Fire



4 Sample Collection

On May 14, 1990, the site of the fire was visited and a series of eleven soil and vegetation samples were collected. A site approximately 2.5 kilometres west of the transformer station was identified for the collection of control samples.

Vegetation samples consisted of foliage removed from tree branches facing the fire. Soil samples were taken from the top one centimetre. Special protocols for collection of environmental samples destined for analysis of organic contaminants were followed. These included solvent washing of sampling equipment between samples and using special solvent-washed glass containers.

According to the Cambridge District office, litigation was under consideration in this case. Therefore, handling and transportation precautions required for collection and submission of legal samples were taken.

Following are descriptions of all samples.

1 Linden foliage from tree at western end of fence enclosing transformer station

2 Linden foliage from tree approximately 17 metres south of transformer

3 Linden foliage from tree at eastern end of fence enclosing transformer station

4 Sugar Maple foliage from tree approximately 25 metres from station fence

5 Norway Maple foliage from tree on the 'front yard' of St. Jean de Brebeuf School

6 Soil sample (0-1 cm) from second base area of softball diamond on school grounds

7 Soil sample (0-1 cm) from home plate area of softball diamond on school grounds

8 Manitoba Maple foliage from tree along gravel road, southeast of transformer

9 Soil sample (0-1 cm) 25 metres from edge of plowed field southeast of station

10 Soil sample (0-1 cm) 50 metres from edge of plowed field southeast of station

11 Soil sample (0-1 cm) 75 metres from edge of plowed field southeast of station

12 Linden foliage from control site, Orchard Park.

13 Norway Maple foliage from control site, Orchard Park.

14 Soil sample (0-1 cm) from control site, Orchard Park.

5 Sample Analysis and Results

All of the above described samples were submitted to the Trace Organics Section of the Laboratory Services Branch for analysis of polychlorinated biphenyls (PCB). The Certificate of Analysis reported that "*No PCB's were detected to a detection limit of 20 ppb*" for any sample.

In addition to these analyses for PCB's, four samples were selected for analysis of chlorinated dibenzo-p-dioxins (CDD) and chlorinated dibenzofurans (CDF). These consisted of foliage samples from Sites 2 and 5, and soil samples from Sites 6 and 9. Since detection limits varied, the results are reported in the table below. Except for one dioxin congener (O8CDD) in the two soil samples, there were no dioxins or furans detected.

Dioxin and Furan Concentrations (ppt) in Selected Samples

	Linden Site 2	Norway Maple Site 5	Soil 0-1 cm Site 6	Soil 0-1 cm Site 9
2378-T4CDD	-	-	< 20	< 6
T4CDD	<100	< 10	< 20	< 6
P5CDD	<100	< 30	< 10	< 10
H6CDD	< 20	< 5	< 40	< 10
H7CDD	< 20	< 8	< 30	< 7
O8CDD	< 70	< 30	**66**	**41**
T4CDF	< 90	< 10	< 20	< 6
P5CDF	< 20	< 6	< 8	< 4
H6CDF	< 20	< 3	< 10	< 5
H7CDF	< 20	< 7	< 40	< 20
O8CDF	< 50	< 30	< 30	< 8

6 Discussion

A report to the Canadian Council of Resource and Environment Ministers (Clarke et al, 1987) recommends interim guidelines for PCB's in soil. The following is quoted from the Executive Summary of this report.

> *Based on existing standards and several human health exposure scenarios, the following interim maximum acceptable concentrations (MAC), on a dry weight basis, are recommended for PCB's in soil:*
>
> - *agricultural soil, including home gardens* — *0.5 ppm*
> - *non-agricultural soil, e.g. residential or general public access* — *5 ppm*
> - *industrial / commercial soil* — *50 ppm*

The O8CDD detected in the two soil samples are at very low concentrations. This congener is frequently encountered in soil, even in rural background samples. The concentrations are within the rural background range as reported in Pearson et al (1990).

7 Conclusions

Based on the analysis of tree foliage and soil samples for PCB's, dioxins and furans, the fire at the Ontario Hydro transformer station did not result in detectable contamination of vegetation or soil.

8 References

Clarke, J.D., M. Richardson, B. Hanna-Thorpe and M. Beaulieu, Interim Guidelines for PCB's in Soil, A Report to the Canadian Council of Resource and Environment Ministers, 1987

Pearson, R.G., D.L. McLaughlin and W.D. McIlveen, Concentrations of PCDD and PCDF in Ontario Soils from the Vicinity of Refuse and Sewage Sludge Incinerators and Remote Rural and Urban Locations, Chemosphere, 20: 1543-1448, 1990